



## Understanding Water-based and PCM Coolants

A CSafe whitepaper on the benefits of using water-based and PCM temperature control packaging systems.

### Introduction to water-based and PCM coolants

This document provides guidance on the selection of water-based or PCM Pharmacool® coolants, and details the benefits of both types of Pharmacools based on CSafe qualification methodology.

Both water-based and PCM Pharmacool coolants achieve cooling by changing states or phases, most commonly from a solid to a liquid, a process which absorbs heat. Either type of Pharmacool can be used to maintain the two most common product temperature ranges: +2°C to +8°C and +15°C to +25°C.



**+2°C to +8°C**



**+15°C to +25°C**



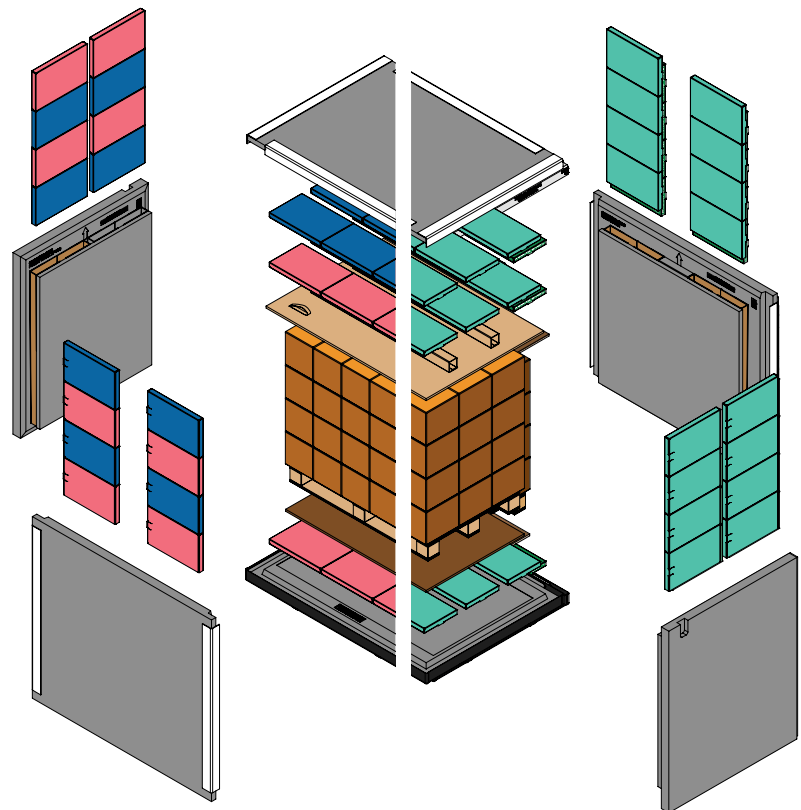
## Water-based coolants

Water goes through phase change at 0°C which is a few degrees colder than the ideal temperature for the shipping of temperature-sensitive goods with a temperature range of +2°C to +8°C.

To achieve the optimal temperature range, a thermal 'gradient' is created using a combination of Chilled (+5°C) and Frozen (-20°C) Pharmacoools within a layer of internal insulation. This combination results in the desired +2°C to +8°C temperature range being maintained within the shipping system for a specific duration.

Ambient or CRT (Control Room Temperature) products tend to have a temperature range of +15°C to +25°C, so Pharmacoools are conditioned at +20°C without the need for phase change to occur.

- +2°C to +8°C
  - +5°C water-based coolants ■
  - 20°C water-based coolants ■
- +15°C to +25°C
  - +20°C water-based coolants ■





## PCM coolants

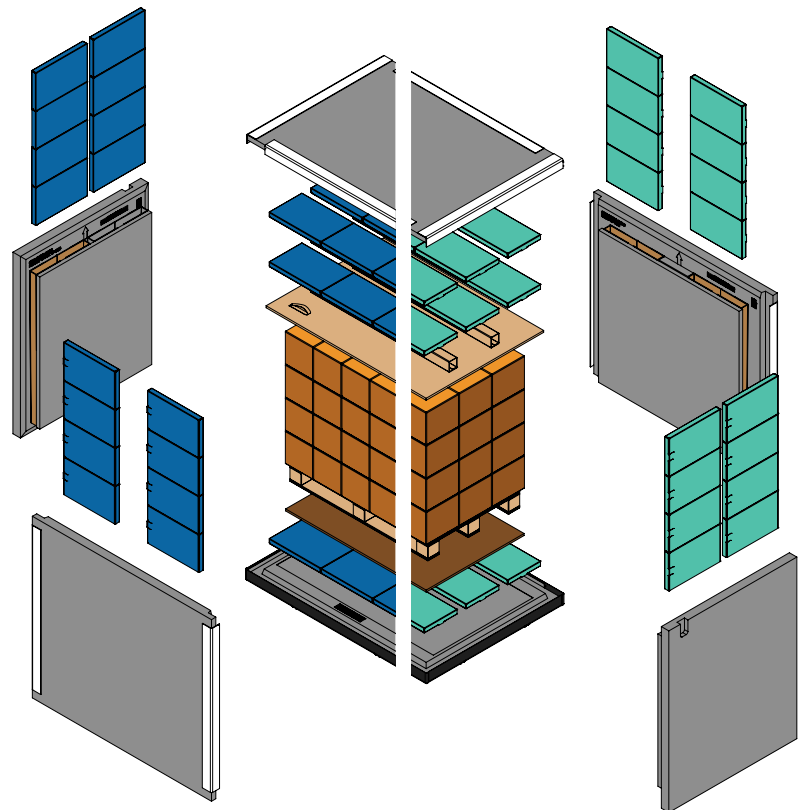
PCM coolants work on a similar principle to water-based coolants; however, as these have been designed to have a phase change or “melting” point at the desired product temperature (i.e. +5°C) only a single layer of insulation and coolant is required. This simplifies the pack-out configuration and conditioning process.

PCM means ‘Phase Change Material’ which is a term used to describe a range of different materials which are mixed and conditioned to provide very specific temperature control.

PCM Pharmacools for ‘Ambient’ or CRT use cooling materials with a Phase Change point of +20°C so are ideal for products with a temperature range of +15°C to +25°C.

+2°C to +8°C  
+2°C to +8°C PCM coolants ■

+15°C to +25°C  
+15°C to +25°C PCM coolants ■





## Benefits of PCM coolants

Using Pharmacool PCM coolants has the following benefits over water-based coolants, particularly when shipping temperature sensitive products requiring strict +2°C to +8°C thermal performance:



All-Year (Universal) Configuration with ONE Pharmacool type and temperature.



Enable cold storage before and during shipping, without incurring temperature excursions.



Thermally robust 'Pack, Ship & Forget'. Excursion reduction over water-based systems used in uncontrolled lanes.



Greater performance (168 hours+).



Increased payload. Lower shipping weight. Fewer overall system components. Reduces operational complexity resulting in fewer overall system components.



No risk of cold shock. Seasonal pack-outs are not required.



## Water-based or PCM?

The decision to select a shipping system with either water-based or PCM Pharmacoools depends on a number of factors:

- Lane characteristics such as Phases of Temperature and/or Extreme Temperatures
- Is it shipped as general cargo, or using a specialized service?
- Shipping duration, for example Short haul/Domestic 24 to 72 hours or Long haul/International 72 to 120+ hours
- Desired Qualification profile (i.e. ISTA 7D)
- Patient need, shelf life and product value
- Complexity of packing operations
- Conditioning capabilities (Ambient, Frozen and Chilled facilities)
- Short, Narrow or No product stability data
- Previous temperature excursions on the shipping lane

CSafe can provide the most suitable shipping systems and optimal Pharmacoool configurations based on different scenarios and help you assess and identify the root cause for any historic excursions.



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